Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Excretion and homeostasis

Time allowed: 1 hour 35 minutes

Subject code **0610**

Biology

Questions from Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 97

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 97 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Fig. 6.1 shows a section through human skin.

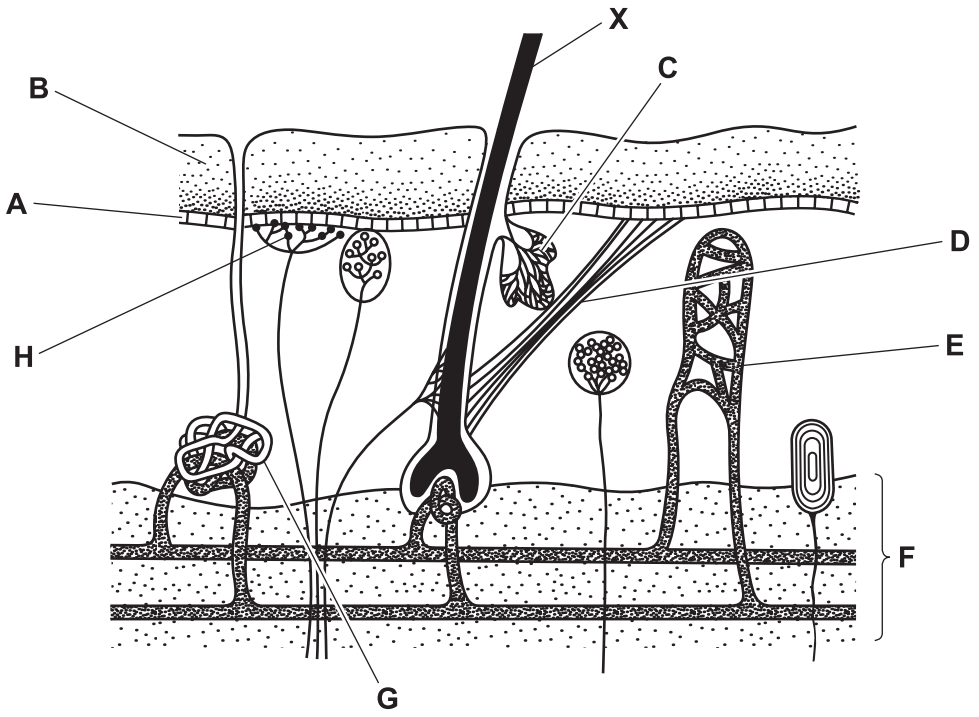


Fig. 6.1

(a) In Table 6.1, write the letter from Fig. 6.1 which labels the structure that carries out each of the functions.

One has been completed for you.

Table 6.1

function	letter
helps to prevent dehydration of the body	**B**
detects changes in the external temperature	
dilates when body temperature rises	
prevents most heat loss from the body	
produces a fluid to help the body lose heat	

[4]

(b) Name the structure labelled **X** on Fig. 6.1.

X ..... [1]

[Total: 5]

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Homeostasis: blood glucose and body temperature Click for more variations

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1 (a)	<table><tr><th>function</th><th>letter</th></tr><tr><td>helps to prevent dehydration of the body</td><td>B</td></tr><tr><td>detects changes in the external temperature</td><td>H;</td></tr><tr><td>dilates when body temperature rises</td><td>E;</td></tr><tr><td>prevents most heat loss from the body</td><td>F;</td></tr><tr><td>produces a fluid to help the body lose heat</td><td>G;</td></tr></table>	[4]	No mark for B
(b)	**X**– hair;	[1]	
		[Total: 5]	

2 Choose words from the list to complete the sentences.

Each word may be used once, more than once or not at all.

accommodation **brain** **vasoconstriction** **diffusion**

vasodilation **evaporation** **heart** **homeostasis**

saliva **sweat** **tears**

The skin helps to keep the body temperature constant. This is part of the process called ..... .

Control of body temperature is coordinated by the ..... .

If the temperature of the blood rises above normal, the body responds by ..... of the blood vessels near the surface of the skin.

Some glands in the skin also produce ..... which helps cool the body by ..... . [5]

[Total: 5]

Homeostasis: blood glucose and body temperature Click for more variations

Reduced to 78% to fit the page (wider than A4).

2	homeostasis; brain; vasodilation; sweat; evaporation;	[5]	
		[Total 5]	

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3 Fig. 3.1 shows the excretory system in a human male.

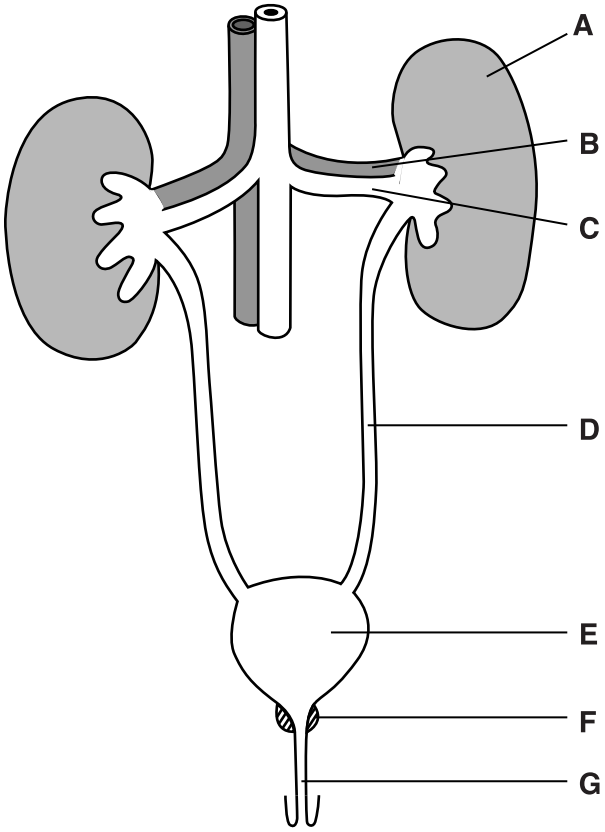


Fig. 3.1

(a) Table 3.1 shows five functions of parts of the excretory system. Complete the table by:

- naming the part that carries out each of the functions
- using the letters from Fig. 3.1 to identify the structures named.

Table 3.1

description of function	name	letter on Fig. 3.1
carries urine and sperm out of the body		**G**
filters urea and other wastes from the blood	kidney	
stores urine until it is convenient to expel it		**E**
carries blood with a high urea content	renal artery	
carries urine away from the kidney		**D**

[5]

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(b) Urine contains urea.

(i) State where urea is produced in the body.

.....[1]

(ii) Name the substance which is broken down to produce urea.

.....[1]

Table 3.2 compares the amounts of four different substances in blood plasma and urine.

Table 3.2

substance	quantity / percentage per 100 cm^3 of fluid	
	blood plasma	urine
water	91.50	95.50
urea	0.03	2.10
glucose	0.10	0.00
salts	0.41	0.61

(iii) Use the information in Table 3.2 to describe how blood plasma differs from urine.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

Excretion and the kidney Click for more variations

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3 **(a)**	<table><tr><th>name</th><th>letter</th></tr><tr><td>urethra ;</td><td>G</td></tr><tr><td>kidney</td><td>A ;</td></tr><tr><td>bladder ;</td><td>E</td></tr><tr><td>renal artery</td><td>C ;</td></tr><tr><td>ureter ;</td><td>D</td></tr></table>	[5]	
(b) (i)	liver ;	[1]	
(ii)	(excess) amino acids / proteins ;	[1]	**A** polypeptides / peptides / peptones
(iii)	<table><tr><th>blood plasma</th><th>urine</th></tr><tr><td>more glucose / glucose present</td><td>glucose absent ;</td></tr><tr><td>less urea less salts less water / more concentrated urine</td><td>**ora** ; **ora** ; **ora** ;</td></tr></table>	max [3]	
		[Total: 10]	

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4 Fig. 9.1 shows changes in the relative concentrations of four substances in the blood plasma. These changes happen when the blood flows through the renal artery, the capillaries in the kidney and the renal vein.

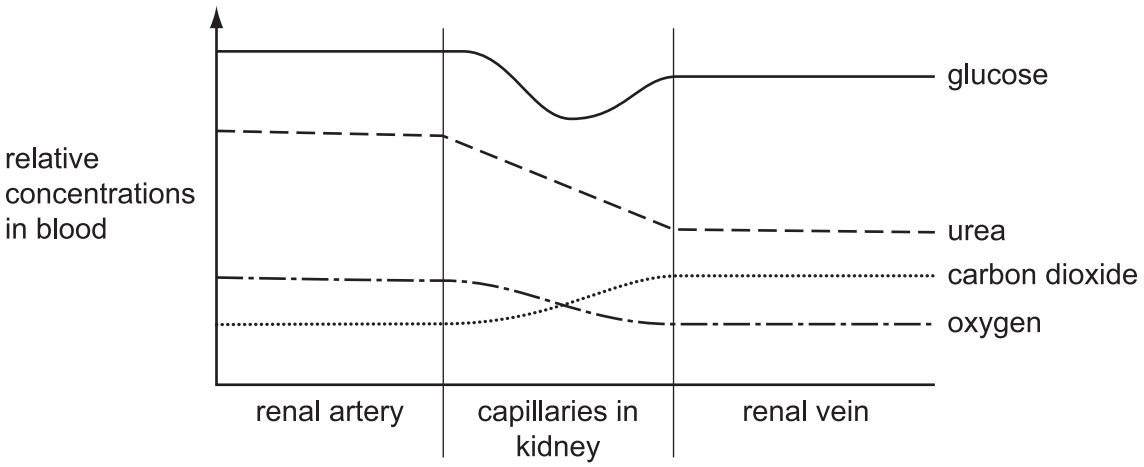


Fig. 9.1

(a) Explain the difference in the concentration of urea in the renal vein and in the renal artery.

.....

.....

.....

.....

.....

..... [3]

(b) Explain the differences in the concentration of oxygen **and** carbon dioxide shown in Fig. 9.1.

.....

.....

.....

.....

.....

..... [3]

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(c) Describe **and** explain the changes in glucose concentration shown in Fig. 9.1.

.....

.....

.....

.....

.....

..... [3]

[Total: 9]

Excretion and the kidney Click for more variations

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4	**(a)**	1. less in (renal) vein/ORA; 2. (kidney) removes/excretes/filters urea; 3. from blood (plasma); 4. in capillaries/glomerulus; 5. not all removed/not reabsorbed;	[max 3]	**A** – drop in urea concentration Any three – 1 mark each.
	(b)	1. fall in oxygen concentration; 2. rise in carbon dioxide concentration; 3. respiration (in kidney); 4. aerobic; 5. oxygen used up (from blood); 6. carbon dioxide produced/added (to blood);	[max 3]	**I** – refs to the blood vessels Any three – 1 mark each.
	(c)	1. drop in glucose concentration; 2. kidney removes/filters glucose; 3. then concentration rises; 4. as glucose is reabsorbed (into blood); 5. none lost in urine; 6. final concentration lower than original/OWTTE; 7. as some is used in respiration/for energy;	[max 3]	**A** – accept ref to some in urine of diabetics Any three – 1 mark each.
			[Total: 9]	

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5 **(a)** **(i)** Name the term that is used to describe the maintenance of a constant internal environment.

.....

[1]

(ii) State two advantages to a mammal of maintaining a constant body temperature.

1. .....

.....

2. .....

.....

[2]

(b) Fig. 7.1 shows changes in a person's body temperature before, during and after a period of exercise.

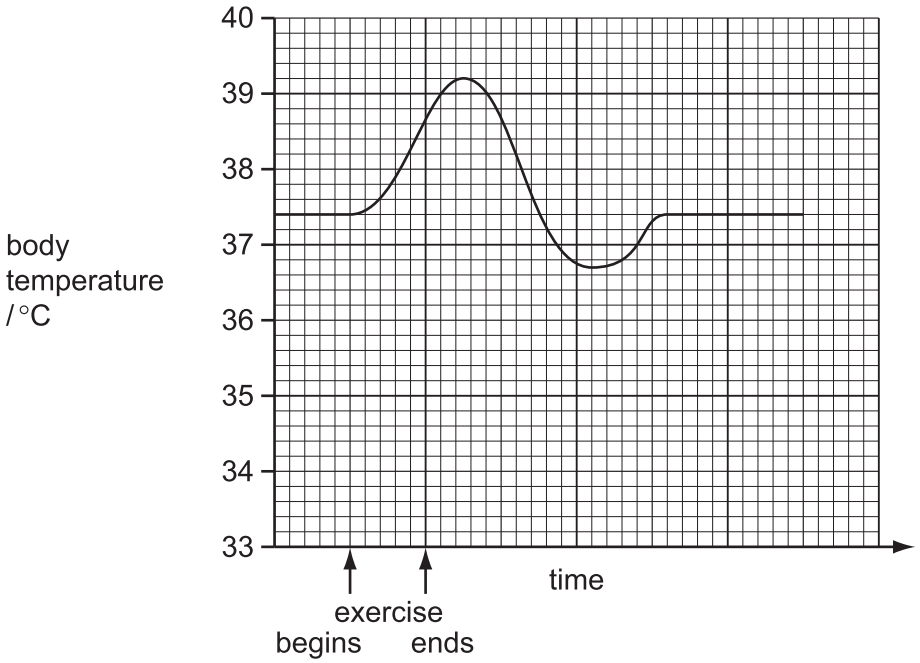


Fig. 7.1

(i) Using information from Fig. 7.1, state the normal body temperature of this person.

..... °C. [1]

(ii) Explain what is meant by the term *vasodilation*.

.....

.....

[1]

(iii) On Fig. 7.1, label with an **X** a point when vasodilation is having an effect on the person's body temperature. [1]

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(iv) Explain how vasodilation affects body temperature.

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

Homeostasis: blood glucose and body temperature Click for more variations

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5 **(a)** **(i)** homeostasis; [1]	**I** – specific examples
(ii) 1 allows constant metabolic rate/OWTTE; 2 allows enzymes to work (at constant rate); 3 reduces risk of denaturing/destroying them; 4 mammal independent of external temperature/can function in wide range of environments/OWTTE; *any two – 1 mark each* [2]	**A** – gives optimum temperature for enzymes
(b) **(i)** 37.4; [1]	
(ii) widening of/relaxing of blood vessels/arterioles/muscles in arterioles; [1]	**A** – capillaries are widened
(iii) **X** placed on any point along downward curve; [1]	**A** – just before peak
(iv) 1 vasodilation allows more blood to flow; 2 through surface capillaries/blood vessels; 3 more heat loss occurs; 4 by radiation; 5 by convection; 6 so body temperature falls; *any four – 1 mark each* [4]	
[Total: 10]	

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6 **(a)** Define the term *excretion*.

.....

.....

.....

.....

..... [3]

Fig. 2.1 shows a kidney tubule and the blood vessels associated with it.

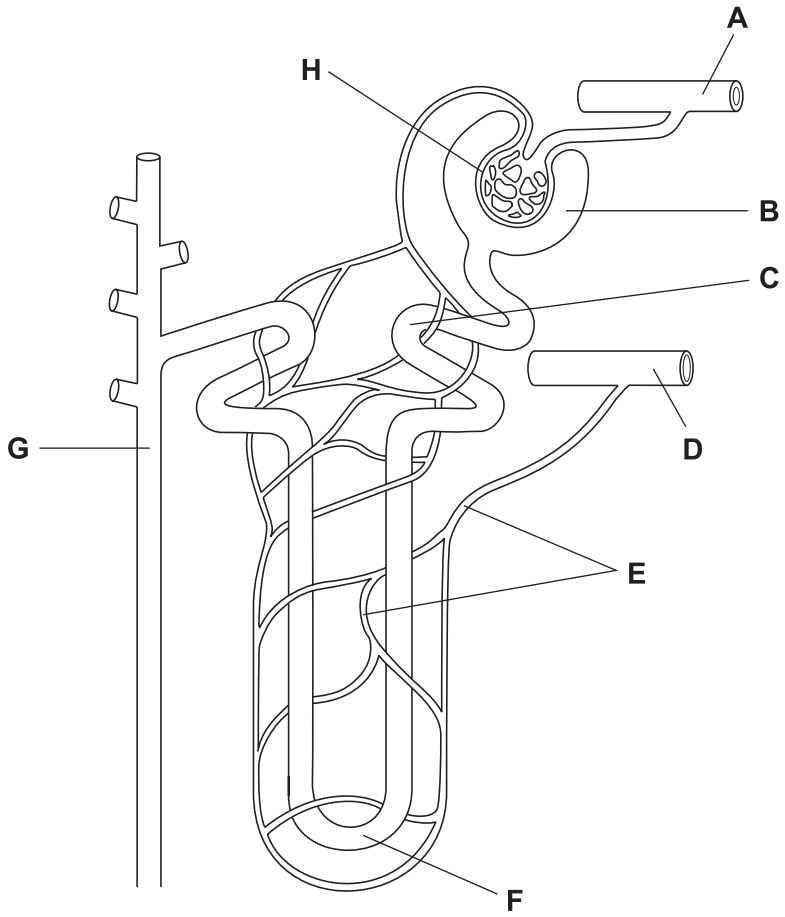


Fig. 2.1

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(b) Table 2.1 shows some processes that occur in a kidney.

In Table 2.1, write the **letter** of the part shown in Fig. 2.1 where each process occurs.

You must put **one** letter in each box. You may use the same letter more than once.

Table 2.1

process	letter
filtration of blood	
reabsorption of most of the solutes from the filtrate	
water is absorbed by osmosis to determine the concentration of urine	
unfiltered blood returns to the renal vein	

[4]

(c) Table 2.2 lists the components of blood, filtrate and urine.

Table 2.2

component	blood	filtrate	urine
red blood cells	✓	×	×
white blood cells	✓		
plasma proteins	✓		
glucose	✓		
urea	✓		
salts	✓		
water	✓		

Complete the table by using ticks (✓) and crosses (×) to show whether or not each component is present in filtrate and in urine of a healthy person. The first component has been done for you. [2]

[Total: 9]

Characteristics of living organisms Click for more variations

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6	(a)	1 2 3 4	removal from the body / organism / cell **R** 'excreted from body' poisons / toxins / harmful substances named example OR waste products / of metabolism / respiration / deamination / chemical reactions in cells or in the body substances in excess (of requirements) / AW	[max 3]	**Ig** faeces, egestion, defecation, digestion AW **A** 'substances that cause harm' / 'harmful' *toxic waste products of metabolism / AW = 2 marks* ***ignore*** *routes from body* Mpt 3. **A** named examples, e.g. CO_2, urea, salt, named ions, amino acids

(b)

process that occurs in the kidney tubule	letter from Fig. 2.1
filtration of blood	**H**
reabsorption of most of the solutes in the filtrate	**C**
water is absorbed by osmosis to determine the concentration of urine	**G**
unfiltered blood returns to the renal vein	**D / E**

[4]

component	blood	filtrate	urine	
red blood cells	✓	×	×	one mark for the filtrate column one mark for the urine column
white blood cells	✓	×	×	
plasma proteins	✓	×	×	
glucose	✓	✓	×	
urea	✓	✓	✓	
salts	✓	✓	✓	
water	✓	✓	✓	

[2]

[Total: 9]

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7 Fig. 6.1 shows the changes in glucose concentration of the blood.

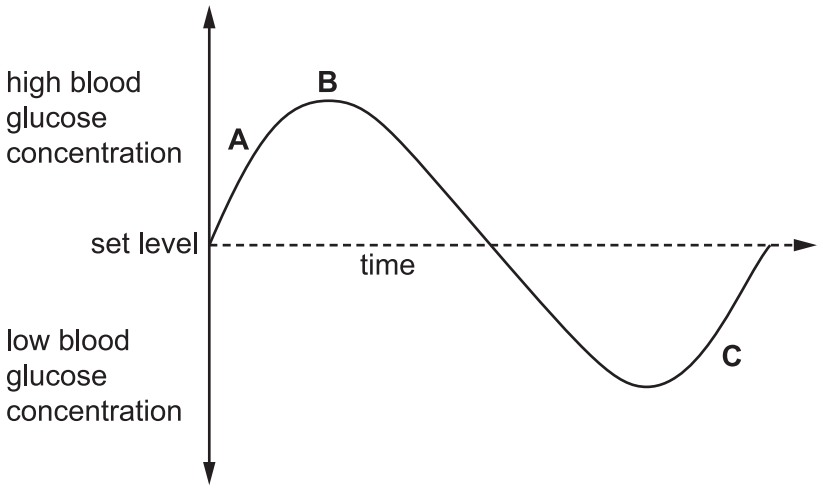


Fig. 6.1

(a) Name the process that maintains blood glucose concentration within set limits.

..... [1]

(b) **(i)** Name the hormone that would be secreted in response to the increasing blood glucose concentration at **A** in Fig. 6.1.

..... [1]

(ii) Name an organ that is responsible for the decrease in blood glucose concentration after **B** in Fig. 6.1.

..... [1]

(iii) Name the compound that is converted to glucose at **C** in Fig. 6.1.

..... [1]

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(c) Describe the symptoms **and** treatment of Type 1 diabetes.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 9]

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Homeostasis: blood glucose and body temperature Click for more variations

7 **(a)**	homeostasis / negative feedback ;	[1]	
(b) (i)	insulin ;	[1]	
(ii)	liver / muscle / pancreas ;	[1]	
(iii)	glycogen ;	[1]	
(c)	*Symptoms:* fatigue / AW ; thirst / AW ; increased urination / glucose in urine / fruity breath / ketosis / flushed face; weight loss / nausea / vomiting / abdominal pain / hunger ; blurred vision / glaucoma ; behavioural changes / confusion / faint / unconscious / coma(tose) / dizzy / rapid breathing / deep breathing ; slow (wound) healing / poor circulation ; *Treatment:* insulin ; by injection / insulin pump ; regular blood glucose tests ; regular meals / controlled diet ;	[max 5]	max 3 from either section **A** weakness **I** death **A** meal plan / healthy eating / monitoring carbohydrates / avoid sugary foods, drinks and fruit juices / eat complex carbohydrates / intake of sugar if blood sugar concentration is too low
		[Total: 9]	

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8 Fig. 3.1 is a diagram that shows the control of blood glucose concentration.

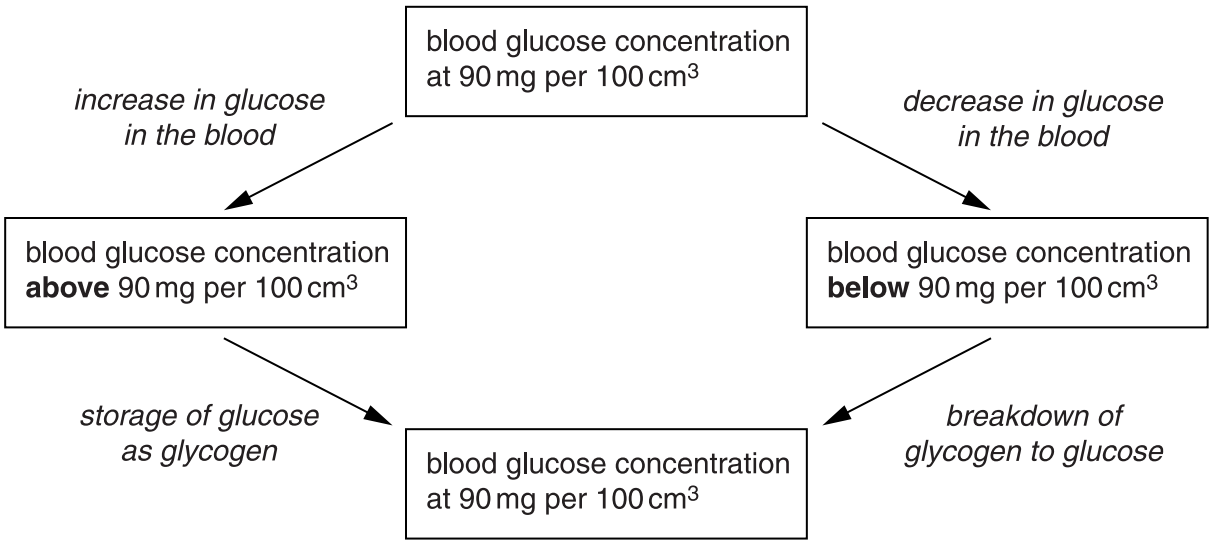


Fig. 3.1

(a) (i) State **one** reason why the concentration of glucose in the blood **increases.**

.....

.....[1]

(ii) State **one** reason why the concentration of glucose in the blood **decreases.**

.....

.....[1]

(iii) Name **two** places in the body where glycogen is stored.

1 .....

2 .....
[2]

(b) Explain how an increase in glucose concentration is controlled in the body.

.....

.....

.....

.....

.....

.....[3]

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(c) If the blood glucose concentration is very high there is a decrease in the water potential of the blood. This may damage the red blood cells.

Explain how a decrease in water potential of the blood may damage red blood cells.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

Homeostasis: blood glucose and body temperature Click for more variations

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8 (a) (i)		eaten / absorbed, a (sugary / high carbohydrate) meal / AW ; (secretion / effect, of) adrenaline ; (secretion / effect, of) glucagon ; dehydration / loss of water ;	max [1]	
(ii)		used in respiration ; (named) exercise / physical activity ; hungry / fasting / starvation ; (secretion / effect, of) insulin ;	max [1]	
(iii)		liver ; muscle ; kidney ; testes ;	max [2]	
(b)	1 2 3 4 5 6	pancreas / islets of Langerhans, detects increase in glucose concentration ; (pancreas / islets) secretes / produces, insulin ; transported in, blood / plasma ; liver / muscle / cells, convert glucose to glycogen ; ref to, enzymes (converting glucose to glycogen) ; homeostasis / negative feedback ;	max [3]	
(c)		water, diffuses out of (red blood cells) ; through, partially permeable membrane ; by osmosis ; down water potential gradient / from high water potential to low water potential ; (red cells) decrease in volume / shrink / crenated / AW ;	max [3]	

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9 Fig. 2.1 shows a diagram of human skin in hot weather.

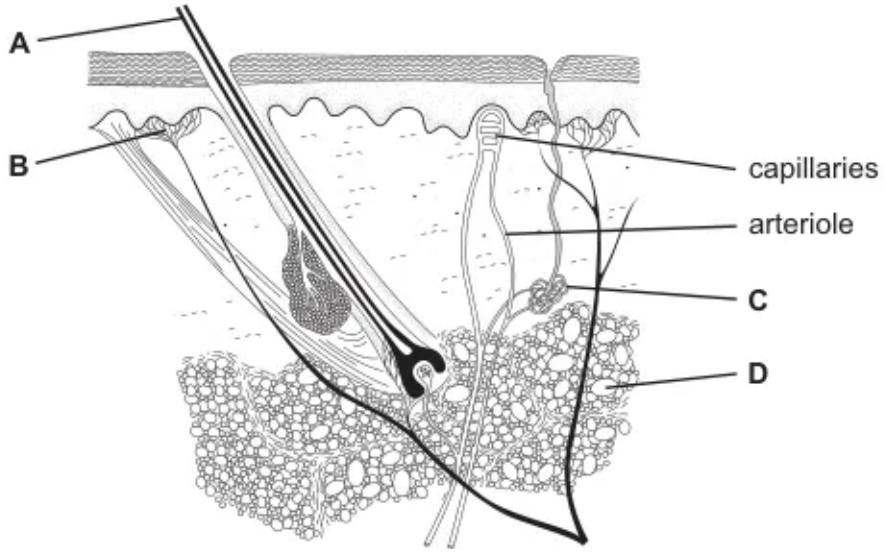


Fig. 2.1

(a) Name structures **A** to **D**.

A .....

B .....

C .....

D ..... [4]

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(b) Describe how the structures (**A** to **D**) in the skin help to maintain a constant body temperature. You may refer to the structures by their letters.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) **(i)** Blood flow through the skin changes in response to changes in the air temperature.

State **and** explain what happens to blood flow through the skin when the temperature of the surrounding air becomes very cold.

.....

.....

.....

.....

.....

.....

(ii) Explain how the changes you have described in **(c)(i)** reduce heat loss.

.....

.....

.....

.....

.....

..... [5]

(d) The control of body temperature is an example of negative feedback.

Describe how negative feedback is involved in the control of body temperature.

.....

.....

.....

.....

..... [3]

[Total: 16]

Homeostasis: blood glucose and body temperature Click for more variations

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9 **(a)**		**A** – hair ; **B** – (temperature) receptor ; **A** (sensory) nerve ending **C** – sweat gland ; **D** – fat (cell) ;	[4]	**R** follicle **A** neuron **R** nerve **A** fat layer / fat tissue / adipose / lipid **R** 'fat droplet'
(b)		*marking points are linked 1 + 2, etc.*		**NB** if structures in (a) labelled incorrectly allow *ecf*
		*hair / **A***		
	1	raises hair + traps air ; **A** ORA		**if** structure is not on the mark scheme, but correct and appropriate function is given, allow **one** mark (*ecf*)
	2	air is (good) insulator ;		
		*temperature receptor / **B***		
	3	detects change in temperature ;		(**BUT** if unqualified letters are used must link to what is given in (a))
	4	impulses to the, CNS / brain / spinal cord ;		*e.g. **D** is an artery/blood vessel in (a) – ✗* *D vasodilates if too hot in (b) – ✓*
		*sweat gland / **C***		
	5	secretes / produces, sweat + evaporates from surface of skin ; ORA		
	6	heat lost from the body / blood cooled / AW ; ORA		**R** 'signals/messages' in MP 4
		*fat / **D***		
	7	insulator ;	[max 4]	

(c)		*mark **(i)** and **(ii)** together to max 5*		
(i)	**1**	(vaso)constriction ;		**R** vasoconstriction of veins/capillaries
	2	shunt / AW, opens ;		**Do not accept** 'capillaries move away' / AW *or* ref to muscles in capillaries
	3	less blood flows through the <u>capillaries</u> ;		
	4	blood diverted away from, skin / surface ;		
(ii)	**5**	*idea that* blood distributes heat ;		
		less heat loss		
	6	by radiation ;		
	7	by convection ;		
	8	accept by conduction (to the air) ;	[max 5]	
(d)	**1**	change in, body / skin, temperature ;		**I** ref. to external temperature changes
	2	acts as a stimulus ;		
	3	to keep temperature , constant / at 37 °C / within limits / near set point / at the norm / AW ;		**A** correct ref. to homeostasis
	4	corrective / opposite / AW, action by the body ; e.g. qualified ref to sweating / vasodilation / vasoconstriction / AW ;	[max 3]	the example needs to show how it brings about the corrective action
			[Total: 16]	

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10 The kidney is an organ in the excretory system.

(a) Describe what is meant by the term excretion.

.....

.....

.....

.....

..... [2]

(b) State the name of the substance excreted by the lungs.

..... [1]

(c) Fig. 4.1 shows a simplified diagram of a cross-section of a kidney.

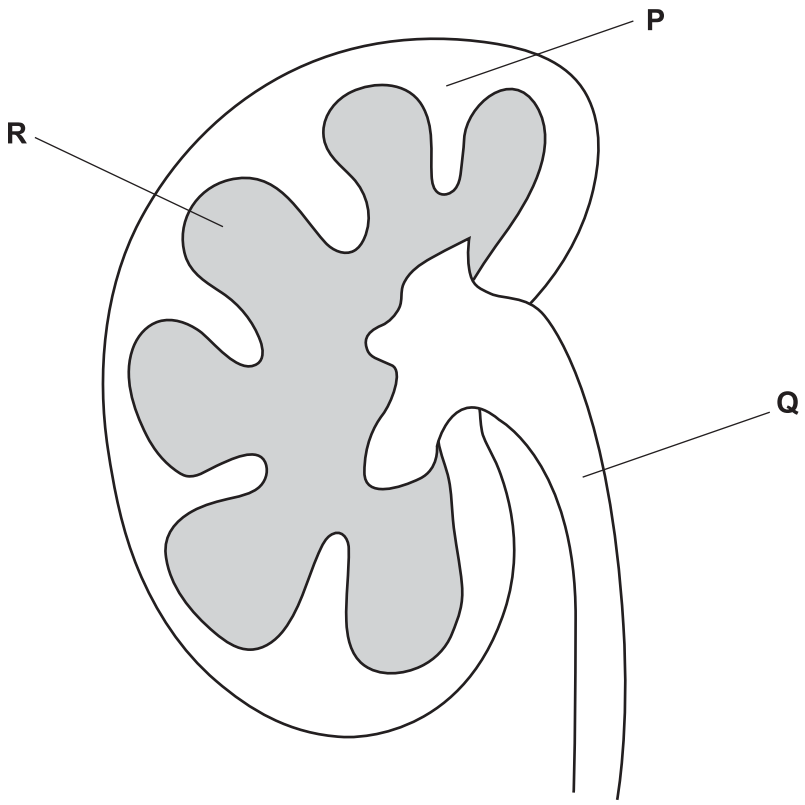


Fig. 4.1

State the names of the parts labelled **P**, **Q** and **R** in Fig. 4.1.

P .....

Q .....

R .....

[3]

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(d) Fig. 4.2 shows the structure of a kidney nephron.

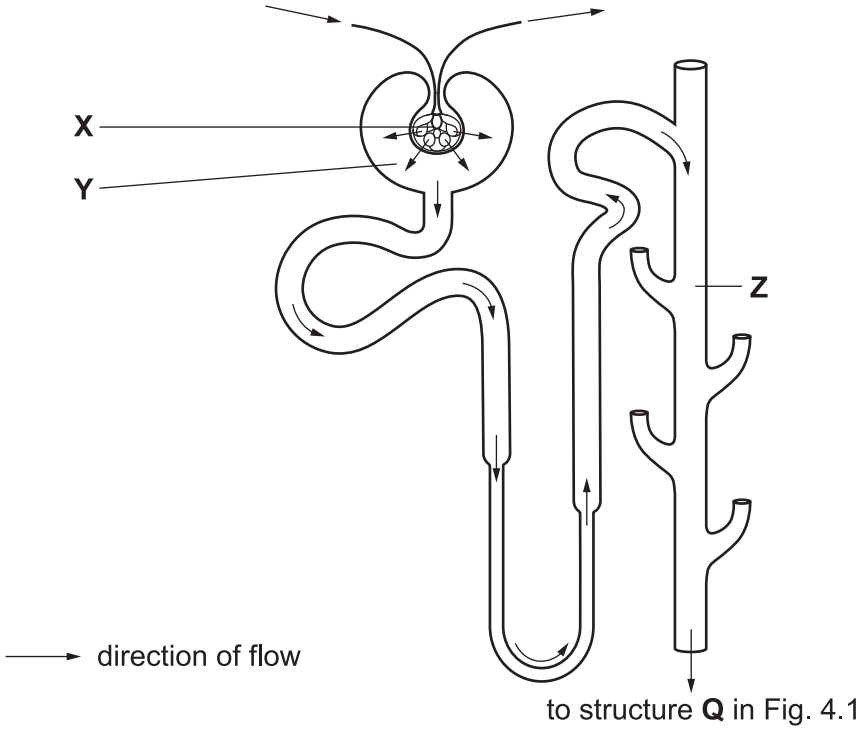


Fig. 4.2

Describe **and** explain the difference in the composition of the fluids in structures **X**, **Y** and **Z** in Fig. 4.2.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

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(e) The liver is also involved in excretion.

Describe **two** ways that amino acids are processed in the liver.

1 .....

2 .....

[2]

[Total: 14]

Excretion and the kidney Click for more variations

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10(a)	removal of waste products of metabolism ; and substances in excess (of requirements) ;	**2**	
10(b)	carbon dioxide ;	**1**	**A** water (vapour)
10(c)	**P -** cortex ; **Q -** ureter ; **R -** medulla ;	**3**	
10(d)	*any six from:* 1 **X** contains blood ; 2 *ref. to* filtration (between **X** and **Y**) ; 3 proteins / blood cells / large molecules, too big to, be filtered / enter **Y** ; 4 **Y** contains, glucose, water, urea **and** ions ; 5 **Z** contains no glucose ; 6 (all) glucose has been reabsorbed (into the blood) ; 7 **Z** contains excess, water / ions ; 8 (some) water / ions, reabsorbed (into the blood) ; 9 **Z** contains high(er), concentration / AW, of urea ; 10 **Z** contains urine ;	**6**	
10(e)	deamination / removal of nitrogen-containing part (to form urea) ; assimilation / conversion to **or** synthesis of proteins ; AVP ;	**2**	

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